

**COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES**

HEARING CHARTER

“A Review of the NASA Fiscal Year 2020 Budget Request”

Tuesday, April 2, 2019
10:00 a.m.
2318 Rayburn House Office Building

PURPOSE

On Tuesday, April 2, 2019 at 10:00 a.m., the Committee on Science, Space, and Technology will hold a Full Committee hearing titled “*A Review of the NASA Fiscal Year 2020 Budget Request.*” The purpose of the hearing is to review the Administration’s FY 2020 budget request and associated issues for the National Aeronautics and Space Administration (NASA).

WITNESS

- **Mr. James F. Bridenstine**, Administrator, National Aeronautics and Space Administration

BACKGROUND

The Trump Administration submitted its request of \$21.019 billion for the NASA for Fiscal Year (FY) 2020. The proposal is \$481 million or about 2 percent lower than the FY 2019 enacted appropriation. The FY 2020 request includes a focus on robotic and human exploration of the Moon; \$10.7 billion of the top-line request is for exploration-related activities, including the goal to send humans to the surface of the Moon by 2028. The request also proposes reorganization of programmatic content. Space technology, which was organized as a cross-cutting technology program supporting Science and Exploration, would be funded under an Exploration Technology account and would focus, significantly, on exploration-related technology activities.

On March 26, 2019, just two weeks after the release of the FY 2020 budget proposal, Vice President Pence, at a meeting of the National Space Council in Huntsville, AL, announced an accelerated schedule for a human landing on the Moon from 2028 to 2024. The Administration has not yet stated whether or not it will request additional funding for the 5-year Moon landing.

Overarching Questions

- *Does the FY 2020 budget proposal support getting humans safely to the Moon by 2024 as the Vice President announced, or even 2028 as the budget request proposes? How much*

additional funding would be needed to accelerate a human Moon landing, and when would it be required?

- *What impacts would the proposed Moon program have on the other missions of NASA—science, aeronautics, space technology—and the balance among those missions?*
- *Does the budget proposal support a consistent plan for NASA, especially NASA’s human exploration program?*

Deep Space Exploration Systems

The Administration’s FY 2020 request proposes \$5.021 billion, a \$30 million or about a .6 percent decrease, for Deep Space Exploration Systems, which includes 1) Exploration Systems Development --Space Launch System (SLS), Orion, and Exploration Ground Systems (EGS)—the key launch and ground capabilities to support deep space exploration, and 2) Exploration Research and Technology, which focuses on technologies and systems developments required for cislunar and lunar surface activities.

Within the Deep Space Exploration Systems account, the request for *Exploration Systems* is \$3.44 billion, a \$650 million or about a 16 percent decrease from the FY 2019 enacted level. Specifically, the request would cut SLS by \$375 million, cut Orion by \$84 million, and does not including funding for development of an Exploration Upper Stage or a second Mobile Launch Platform, which would support a higher lift capability to low-Earth orbit and cislunar space.

The Administration is requesting \$1.58 billion, a \$622 million or 65 percent increase, over the FY 2019 enacted appropriation for *Exploration Research and Development*, which would fund four major areas: 1) Advanced Exploration Systems, which supports the development and demonstration of exploration capabilities such as habitats and space suits; 2) Advanced Cislunar and Surface Capabilities, which would support a series of lunar missions on the lunar surface leading to the landing of humans on the Moon in 2028; 3) the Lunar Gateway, a station that orbits the Moon and serves as a platform to support human and robotic missions to the lunar surface; and the 4) Human Research Program, which supports research to understand and mitigate the risks of human health and performance in space.

The FY 2020 request would increase Advanced Cislunar Systems and Surface Capabilities by \$247 million from the FY 2019 request and the Gateway by \$317 million from the FY 2019 request.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Exploration Systems Development	4395.0	4092.8	3441.7	3441.0	3468.4	3788.5	3654.7
Exploration Research & Development	395.0	958.0	1580.0	1854.5	2013.0	2850.4	3387.6
Total Budget	4790.0	5050.8	5021.7	5295.5	5481.4	6639.0	7042.3

Exploration Technology

The Administration is requesting \$1 billion for Exploration Technology, about a 9 percent increase over the FY 2019 enacted appropriation. For FY 2020, the Exploration Technology would incorporate cross-cutting technology activities that were previously funded under the Space Technology program; however, the overall Exploration Technology account would be focused on technology development for lunar surface activities.

The account is organized into three lines: Early Stage Innovation and Partnerships, which includes early stage research and development supports academia, industry, and NASA entities on far-reaching technology activities; Technology Maturation, which includes efforts to bring technologies from a proof of concept to a more mature stage that is not yet ready for flight demonstration; and Technology Demonstration, which includes ground-based tests and flight demonstrations that validate the technologies for programmatic use by NASA or other Federal agencies and industry. Exploration Technology also manages SBIR and STTR awards.

The request includes a new Lunar Surface Innovation Initiative, which would facilitate the technology readiness of systems focused on lunar surface demonstrations over the next five years, such as in situ resource utilization and nuclear surface power.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Early Stage Innovation and Partnerships	91.9	--	123.4	118.0	123.0	118.0	123.0
Technology Maturation	151.5	--	282.5	227.2	250.3	246.7	328.0
Technology Demonstration	321.7	--	397.5	411.8	391.4	362.3	231.2
SBIR and STTR	194.8	--	210.8	219.1	230.8	237.5	261.0
Total Budget	760.0	926.9	1014.3	976.1	995.4	964.4	943.1

LEO and Spaceflight Operations

The request for Low Earth Orbit (LEO) and Spaceflight Operations is \$4.2857 billion, approximately 7.6 percent below the FY 2019 enacted appropriation. The account includes funding for the International Space Station (ISS) and crew and cargo transportation to and from the ISS.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
International Space Station	1493.0	--	1458.2	1448.5	1449.4	1352.6	1315.7
Space Transportation	2345.8	--	1828.6	1854.1	1814.5	1746.2	1727.2
Space and Flight Support (SFS)	910.3	--	848.9	891.9	905.7	911.8	914.5
Commercial LEO Development	0.0	--	150.0	175.0	200.0	225.0	225.0
Total Budget	4749.2	4639.1	4285.7	4369.5	4369.5	4235.5	4182.3

International Space Station (ISS). The Administration is requesting \$1.458 billion, a decrease of about 2.3 percent from the actual FY 2018 spending, to operate and conduct research on the ISS.

NASA intends to transition its role as an owner and operator of the ISS to a customer of a commercial operator of the ISS or a commercial LEO platform and end by 2025. The ISS budget request line also supports ISS Research, which includes technology development; basic and applied research in physical, chemical, and biological sciences; and Earth imaging and remote sensing. The request includes a 6 percent (\$23 million) decrease from the actual FY 2018 spending on the ISS Research program, the most recent funding comparison.

Space Transportation. The request includes \$1.8286 billion for Space Transportation, about a 22 percent decrease from the FY 2018 actual spending level. The account includes the Commercial Crew and Cargo Program, which funds operational commercial cargo resupply missions and the Russian Roscosmos State Corporation (Roscosmos) seats to transport crew to and from the ISS and the Commercial Crew Program (CCP), which facilitates the development of commercial crew transportation to and from the ISS. The decrease in the request accounts for the planned ramp down of the CCP expenditures as the industry partners approach operational status.

Space and Flight Support. The Administration is requesting \$848.9 million for Space and Flight Support, a decrease of about 7 percent from the FY 2018 actual spending level. Space and Flight Support programs provide mission critical space communications, launch and test services, and astronaut training in service of both NASA and external customer missions. In FY 2020, NASA proposes establishing a new Communications Services Program to establish a path to transition NASA’s LEO communication program to a future architecture based on a mix of commercial services and capabilities.

Commercial LEO Development. The Administration is again requesting \$150 million for a new, focused, TBD effort to develop a commercial space economy in LEO, particularly focused on the transition from NASA’s operation of the ISS to an environment in which NASA is one of many customers of a non-governmentally operated ISS or a commercial space station.

Science

The request for the Science Mission Directorate (SMD) is \$6.3037 billion, about a 9 percent decrease from the FY 2019 enacted appropriation. According to the Congressional Budget Justification document, SMD programs “*focus on three interdisciplinary objectives: discovering the secrets of the Universe, searching for life in the Solar System and beyond, [and] protecting and improving life on Earth.*” SMD includes four divisions: Earth Science, Planetary Science, Astrophysics, and Heliophysics, which is the study of the Sun and the Earth-Sun environment.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Earth Science	1921.0	--	1779.8	1785.6	1779.7	1666.5	1674.6
Planetary Science	2217.9	--	2622.1	2577.3	2629.4	2402.4	2350.9
Astrophysics	850.4	--	844.8	902.4	965.2	913.5	907.7
James Webb Space Telescope	533.7	375.1	352.6	415.1	175.4	172.0	172.0
Heliophysics	688.5	--	704.5	638.6	769.3	692.0	709.8
Total Budget	6211.5	6905.7	6303.7	6319.0	6319.0	5846.5	5815.0

Earth Science. The Administration is requesting \$1.78 billion for Earth Science, about a 7 percent decrease from the FY 2019 enacted appropriation. The request would cancel two mission developments: the Plankton, Aerosol, Cloud, Ocean Ecosystem (PACE) mission and the Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder mission.

The Earth Science account supports research and missions – both airborne and space-based – that contribute to our scientific understanding of Earth and its response to natural or human-induced changes. The division partners with other federal agencies to provide measurements that inform weather and climate predictions, resource management, natural disaster response, and environmental policy.

Planetary Science. The President’s FY 2020 budget requests \$2.62 billion for its Planetary Science Division, a decrease of 4.6 percent from the FY 2019 enacted budget. The request would support a flagship Mars Rover 2020 launch in July 2020 and launch of a Europa Clipper flagship mission in 2023, but recommends a commercially procured launch vehicle for Clipper instead of NASA’s SLS. The proposal does not fund the Europa lander mission, citing cost and the recommendation of the National Academy of Sciences’ Planetary Science decadal survey midterm assessment to prioritize the lander in the next decadal. The request also includes funding for a medium-size (New Frontiers) mission as well as initiation of a Mars Sample Return mission for launch as early as 2026. Planetary Science also funds the identification, characterization, and possible mitigation of asteroids and comets that are potentially hazardous to Earth.

Astrophysics. The Administration’s FY 2020 budget request for the Astrophysics Division is \$845 million, a 29 percent decrease from the FY 2019 enacted budget. The proposal, like the FY 2019 request, seeks to cancel the Wide-Field Infrared Survey Telescope (WFIRST), currently in development. The budget request would also fund medium-class and small competitively-selected missions.

James Webb Space Telescope (JWST). The Administration is requesting \$352.6 million for the development of JWST, which accommodates the total development cost (\$8.8 billion) and new launch date (March 2021) pursuant to Independent Review Board recommendations to NASA and approved in the FY 2019 appropriations. JWST is managed as a standalone project separate from the Astrophysics Division.

Heliophysics. The Administration is requesting \$704.5 million for Heliophysics, about a 2 percent decrease from the FY 2019 enacted appropriation. The Heliophysics Division supports efforts to improve our understanding of the Sun, the Sun-Earth connection and its implication for life on Earth, and the Sun’s interaction with the rest of the Solar System and beyond. The request includes an increase for development of the next Solar Terrestrial Probe (decadal-prioritized Interstellar Mapping and Acceleration Probe) and an anticipated award of new competitively-selected missions. The request also includes \$15 million to support NASA’s role in inter-agency space weather research-to-operations and operations-to-research efforts.

Aeronautics

The Aeronautics Research Mission Directorate’s (ARMD) FY 2020 budget request from the Administration is \$667 million, an 8 percent decrease from the enacted FY 2019 budget. The decrease is attributed to a transfer of aerospace capabilities, including the Aeronautics Evaluation & Testing Capability Project (AETC), into a single project within the Safety, Security, and Mission Service account.

ARMD supports four key Programs: the *Airspace Operations and Safety Program*, which focuses research on the safe and efficient growth of global operations, the *Advanced Air Vehicles Program*, which conducts research on ultra-efficient vehicles, the *Integrated Aviation Systems Program*, which carries out integrated system-level research and technology, and the *Transformative Aero Concepts Program*, which supports hi-risk research across multiple strategic thrust areas for ARMD.

The FY 2020 request supports continuation of the Low Boom Flight Demonstrator Project, which supports development of an experimental aircraft (x-plane) to test new design approaches and community responses to supersonic overland flight. Data from the test is required, if regulatory changes are made to allow commercial supersonic flight. The request would also support testing and integration of electric propulsion components and systems, an Advanced Air Mobility Project for urban air mobility that will move both people and packages, fundamental research on hypersonics, and the safe integration of the rapidly increasing number of autonomous aircraft into the National Airspace System.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Airspace Operations and Safety Program	118.7	--	121.2	130.6	133.5	136.2	138.9
Advanced Air Vehicles Program	237.7	--	188.1	203.3	212.2	219.3	224.2
Integrated Aviation Systems Program	221.5	--	233.2	209.4	202.2	97.1	87.2
Transformative Aero Concepts Program	112.2	--	124.4	130.3	132.3	134.6	136.7
Total Budget	690.0	725.0	666.9	673.6	680.3	587.1	587.0

STEM Engagement

The FY 2020 Budget proposes the termination of NASA’s Office of STEM Engagement, which was appropriated \$110 million in FY 2019. The Office of STEM Engagement supports programs focused on attracting young people to STEM, including the National Space Grant and Fellowship Program, the Established Program to Stimulate Competitive Research (EPSCoR), and the Minority University Research and Education Project (MUREP).

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Total Budget	100.0	110.0	0.0	0.0	0.0	0.0	0.0

Safety, Security, and Mission Services

The Administration is requesting \$3 billion for Safety, Security, and Mission Services (SSMS), a 12 percent increase over the FY 2019 enacted appropriation. Within the SSMS account, the *Center Management and Operations* budget funds ongoing management, operations, and maintenance at centers and component facilities. The *Agency Management and Operations* budget provides management and oversight of Agency missions and performance of NASA-wide mission support activities and also supports Safety and Mission success.

The SSMS request includes an increase in facility maintenance activities to help reduce the current backlog of facility maintenance projects and requirements associated with an aging infrastructure.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Center Management and Operations	1983.4	--	2065.0	2058.4	2052.9	1906.0	1905.8
Agency Management and Operations	843.5	--	1019.6	1026.2	1031.7	965.6	965.8
Total Budget	2826.9	2755.0	3084.6	3084.6	3084.6	2871.6	2871.6

Construction and Environmental Compliance and Restoration

The Administration is requesting \$600 million for Construction and Environmental Compliance and Restoration (CECR), a 72 percent increase over the FY 2019 enacted appropriation. The CECR account funds facility design and construction, demolition projects, and environmental compliance and restoration activities. The FY 2020 request includes increased funding for repair of obsolete and deteriorated systems, which will reduce mission and safety risk. The request including funding for two Construction of Facilities projects: The Flight Electronics Integration Facility at the Jet Propulsion Laboratory and The Flight Dynamics Research Facility at Langley Research Center.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Construction of Facilities	483.1	--	517.5	385.9	385.9	385.9	304.9
Environmental Compliance and Restoration	86.4	--	82.9	82.9	82.9	82.9	82.9
Total Budget	569.5	348.2	600.4	468.8	468.8	468.8	387.8

Inspector General

The Administration is requesting \$41 million for the Office of the Inspector General (OIG), about a 6 percent increase over the FY 2019 enacted appropriations. The increase would support salary and benefits adjustments to ensure sufficient staffing to carry out OIG activities.

Budget Authority (in \$ millions)	Actual FY 2018	Enacted FY 2019	Request FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Total Budget	39.0	39.3	41.7	42.1	42.5	43.0	43.4